FEMI.209: 340222

FLOOD INSURANCE STUDY

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CITY OF HOBOKEN, NEW JERSEY
HUDSON COUNTY

MAY 17, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 340222

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FLOOD INSURANCE STUDY
CITY OF HOBOKEN, NEW JERSEY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Hoboken, Hudson County, New Jersey, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Hoboken to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3. In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the New Jersey Department of Environmental Protection, Division of Water Resources for the Federal Emergency Management Agency, under Contract No. H-4623. This work was completed in January 1981. The hydrologic and hydraulic analyses for this study were performed by Harris-Toups Associates under subcontract to the New Jersey Department of Environmental Protection.

1.3 Coordination

An initial Consultation and Coordination Officer's (CCO) meeting was held on February 9, 1978, to identify the areas requiring detailed study. This meeting was attended by representatives of Harris-Toups Associates (H-T), the FEMA, and officials of the City of Hoboken.

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An intermediate CCO meeting was held in March 1981 to discuss coastal flood elevations and delineations. This meeting was attended by representatives of H-T, the New Jersey Department of Environmental Protection (NJDEP - the study contractor), Division of Water Resources, the FEMA, and the City of Hoboken. Coastal flood elevation development for the upper part of Newark Bay and Upper New York Bay was coordinated closely with Tippetts-Abbett-McCarthy-Stratton (TAMS) in New York.

On December 23, 1981, the final CCO meeting was held, attended by representatives of H-T, the NJDEP, Division of Water Resources, the FEMA, and the City of Hoboken.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Hoboken, Hudson County, New Jersey. The area of study is shown on the Vicinity Map (Figure 1).

Tidal flooding from Upper New York Bay which affects the Hudson River was studied by detailed methods. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through January 1986.

2.2 Community Description

The City of Hoboken is located in the northeastern section of the State of New Jersey. Hoboken, which lies in the eastern corner of Hudson County, is bounded on the north by the Township of Weehawken, on the east by the City of New York City, on the south and west by the City of Jersey City, and on the northwest by the City of Union City.

European settlement of Hoboken began when the New Amsterdam Dutch moved into the New Jersey side of New York Harbor early in the seventeenth century. From the beginning of its history, transportation and commerce were key elements in the growth and development of Hudson County. By the end of the eighteenth century, Hudson County was no longer on the western frontier of growth and expansion, but had developed as a primary urban center and its role as a populated industrial/commercial area at the entrance to New York Harbor was established. The first half of the 1800s was a time of accelerating growth, with origins in the early Republic period of American history. Political growth was accompanied by the expansion of individual towns. The trend of population growth and intensifying commercial organization continued, resulting in further

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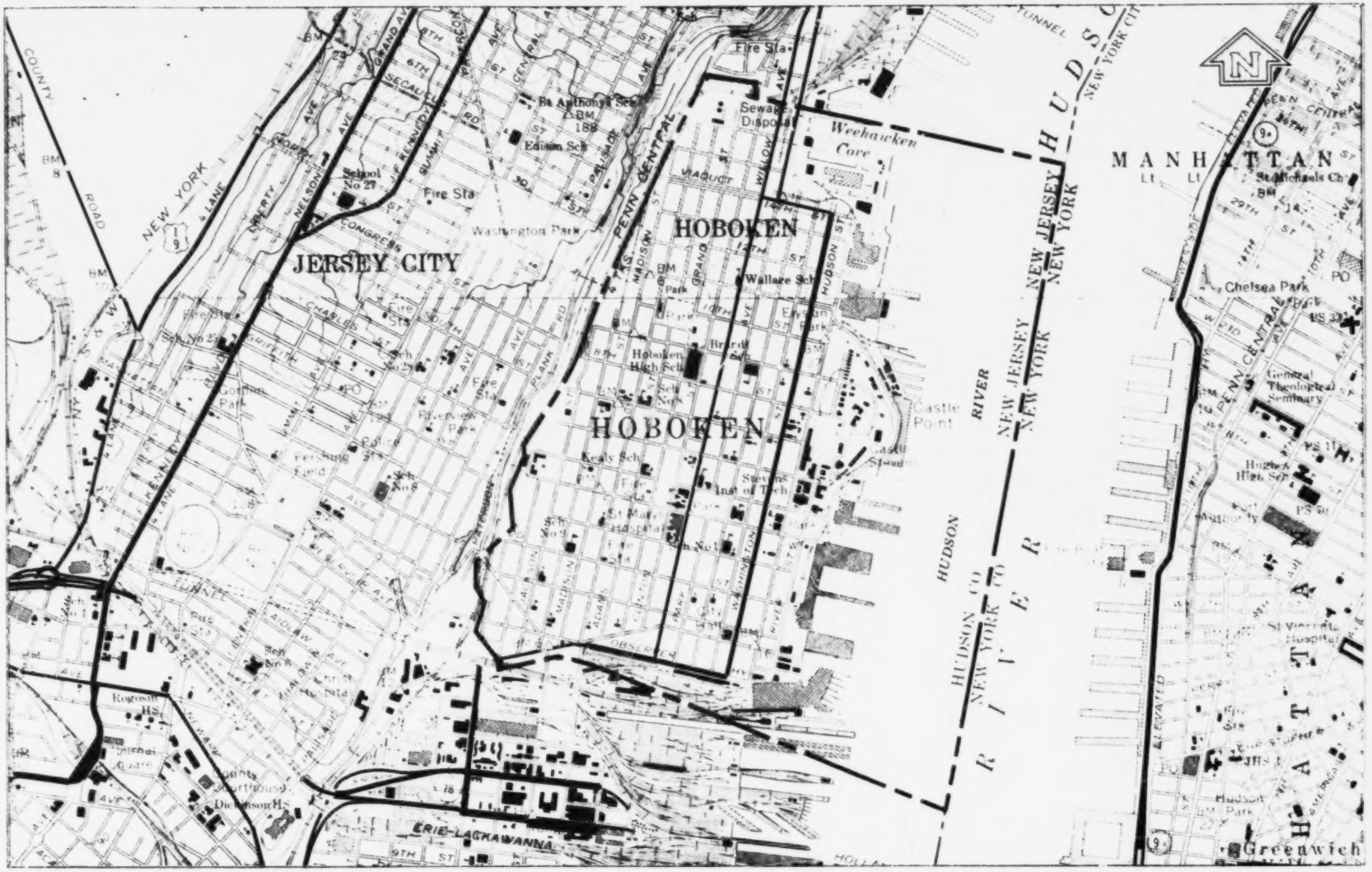

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HOBOKEN, NJ
(HUDSON CO.)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

development of commerce and transportation. The last half of the nineteenth century was a period of elaboration of earlier developments. Transportation advanced through several stages, from turnpikes to canals to the plank road to the railroad.

With the coming of the twentieth century, the patterns of growth established in the late 1800s continued at an accelerated pace. The suburban centers that had formed around the earliest settlements became neighborhoods in a massive urban sprawl which transcended political boundaries and engulfed most of Hudson County. The Motor Revolution, the rise of popularity of the automobile, and the vigorous expansion associated with World War I became the major forces in creating the vast, industrialized area that now encompasses much of Hudson County.

Early 1980 estimates put the population of Hoboken at 42,378 persons. The total land area is 1.26 square miles and the total water area is 0.52 square mile, for a total of 1.78 square miles. In 1980 the population density was approximately 33,633 persons per square mile of land area.

The climate in this area is variable, with winters characterized by cold, dry air masses which have their origin over sub-polar continental regions, and summers characterized by warm, humid air masses from sub-tropical regions, modified by their passage over land surfaces. During the spring and fall, maritime polar air masses become increasingly influential. The city normally receives about 40 inches of rainfall and averages about 30 inches of snowfall per year. The average annual temperature is approximately 54 degrees Fahrenheit (°F), with average lows of 32.2°F in January and average highs of 76.6°F in July (Reference 1).

The topography of Hoboken generally consists of lowlands. Elevations range from sea level to about 25 feet, with the exception of Castle Point, located next to the Hudson River, where the ground surface rises to 100 feet. At the extreme western edge of the city the relief reaches approximately 110 feet due to the dramatic rise of the Palisades (Reference 2).

2.3 Principal Flood Problems

The City of Hoboken is subject to tidal flooding from Upper New York Bay which in turn affects the Hudson River. Most of the flood problems occur in the southern and western portions of the city, which are susceptible to flooding due to their flat topography. Flooding is frequent when annual peak rainfall coincides with a high tide in Upper New York Bay and the Hudson River.

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Tidal floods associated with hurricanes have been the most severe flooding events previously recorded. The flood of record occurred on September 12, 1960, as a result of Hurricane Donna. The water level on the upper part of Newark Bay measured at East Newark reached 8.4 feet at high tide, a level 5.5 feet above normal tide. The storm surge of record in the Hackensack estuary occurred on November 25, 1950, when the water-surface elevation was 9 feet above low tide, reaching a maximum elevation of 6.5 feet. If this surge had occurred at high tide, the flood elevation would have been 12 feet.

2.4 Flood Protection Measures

Presently, there are no flood control measures that would alter flood hazards due to coastal flooding within the City of Hoboken. Residents of the city depend on the usual warnings issued through radio, television and local newspapers for information concerning possible flood conditions. Flood warnings and predicted flood peaks are issued by the National Oceanic and Atmospheric Administration, Flood Forecasting Center, located at Trenton, New Jersey.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one-percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten) and, for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail affecting the community.

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Tidal elevation-frequency relationships for the Hudson River were determined by analyzing the tidal gage records and historical high-water mark data for Upper New York Bay and the upper part of Newark Bay. Tide gages are maintained at East Newark, New Jersey, on the Passaic River, by the U. S. Geological Survey (USGS), and were used as tide data applicable to the upper part of Newark Bay; and at the Battery, New York (Fort Hamilton), which has a longer record for the upper part of New York Bay (since 1921).

A total of 563 northeaster events were analyzed for the years between 1926 and 1976, and their peak storm surge elevations obtained and ranked by a disaggregation program for East Newark and the Battery. The highest storm tide recorded during this period was that of Hurricane Donna, September 12, 1960, with a stage of 8.4 feet.

A correlation was established between maximum water-surface elevations at the Battery (Fort Hamilton) and at East Newark. This correlation may be used to transpose storm tides from the Battery to East Newark and is represented approximately as Hen = 1.06 Hfh, where Hen is the maximum storm tide at East Newark and Hfh is the maximum storm tide at Fort Hamilton (Reference 3).

A summary of tidal elevation-frequency relationships for Upper New York Bay is shown in Table 1, "Summary of Elevations".

TABLE 1 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
UPPER NEW YORK BAY				
At the confluence of the Hudson River	7.0	8.9	9.5	10.5

3.2 Hydraulic Analyses

Hydraulic analyses of the shoreline characteristics of the flooding source studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along the shoreline.

Consideration was given to the vulnerability of the shoreline of Hoboken to wave action during severe hurricanes and northeasters. However, the effects of wave action were found to be minimal.

Water-surface elevations for the eastern shore of Hoboken inundated by tidal flooding from Upper New York Bay were determined from data at the

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Battery, New York gage station (Reference 3). The analysis of this gage data is mentioned in section 3.1.

Interior drainage problem areas were reviewed as possible sources of flooding; but the 100-year tidal water-surface elevation was found to be higher than the 100-year flood elevation caused by a back-up of water from the storm sewers. Therefore, no interior shallow flood boundaries are shown.

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. The 100- and 500-year boundaries were delineated using topographic maps of the study area at a scale of 1:2,400, with a contour interval of 2 feet, superimposed on orthophotos prepared from aerial photographs (References 4 and 5). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Flood boundaries are indicated on the Flood Insurance Rate Map. On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zone A5), and the 500-year boundary corresponds to the boundary of areas of moderate flood hazards (Zone B).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

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5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for the flooding source affecting the City of Hoboken.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses or waterbodies having relatively the same flood hazard. In tidal areas, reaches are limited to the distance for which the difference between the 10- and 100-year flood elevations does not vary more than 1.0 foot. Using these criteria, the entire shoreline of the City of Hoboken qualifies as one reach whose flooding source is Upper New York Bay. The location of this reach is shown on the Flood Insurance Rate Map.

5.2 Flood Hazard Factors

The FHF is the FEMA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of Hoboken was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A5: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.

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Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding source studied in detail in the City of Hoboken.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Hoboken is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FEMA.

6.0 OTHER STUDIES

A Flood Insurance Study (FIS) for the City of Jersey City, New Jersey, is currently being prepared (Reference 6). The results of that study will match the results of this study exactly.

The Flood Insurance Study for the City of New York City, New York has not been completed. However, an effort was made to match this study as much as possible to the preliminary results of the New York City FIS (Reference 7). The 10-, 50-, and 100-year tidal water-surface elevations were found to be comparable. The 500-year tidal water-surface elevation differed significantly. The New York City FIS used an elevation of 11.7 feet, while this study used an elevation of 10.5 feet for the 500-year flood.

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Upper New York Bay (Tidal flooding affecting the Hudson River)	01	-2.5	-0.6	+1.0	025	A5	10

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HOBOKEN, NJ
(HUDSON CO.)

FLOOD INSURANCE ZONE DATA

UPPER NEW YORK BAY

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7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region II Office, 26 Federal Plaza, Room 19-100, New York, New York 10278.

8.0 BIBLIOGRAPHY AND REFERENCES

1. Clinton Bogert Associates for the Hudson County Utilities Authority, 201 Wastewater Facilities Plan-Planning Area III-Facilities Report, Hudson County, New Jersey, January 1979.

2. Clinton Bogert Associates for the Hudson County Utilities Authority, Combined Sewer Study-Planning Area III, Hudson County, New Jersey, June 1979.

3. Tippetts-Abbett-McCarthy-Stratton, Frequency Distribution for Hurricane and Northeaster Tides at Upper Newark Bay, New York, January 1980.

4. Geod Aerial Mapping, Inc., of Oak Ridge, New Jersey, Topographic Maps, Scale 1:2,400, Contour Interval 2 Feet: City of Hoboken, New Jersey.

5. Geod Aerial Mapping, Inc., of Oak Ridge, New Jersey, Orthophotos Prepared from Aerial Photographs, Scale 1:2,400: City of Hoboken, New Jersey.

6. Federal Emergency Management Agency, Flood Insurance Study, City of Jersey City, Hudson County, New Jersey (Unpublished).

7. Federal Emergency Management Agency, Flood Insurance Study, City of New York City, Bronx, New York, Queens, Kings, and Richmond Counties, New York (Unpublished).

Lawler, Matusky and Skelly, Engineers, Changes in Hudson River Water Elevations Resulting from Westway, New York, February 1979.

National Academy of Sciences, Methodology for Calculating Wave Action Effects Associated with Storm Surges, Washington, D. C., 1977.

U. S. Army Corps of Engineers, Galveston District, Guidelines for Identifying Coastal High Hazard Zones, Galveston, Texas, June 1975.

U. S. Department of the Interior, Geological Survey, Map of Flood-Prone Areas, Scale 1:24,000: Jersey City, New Jersey, 1970; Weehawken, New Jersey, 1970.

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U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Jersey City, New Jersey, 1955, Photorevised 1970; Weehawken, New Jersey, 1955, Photorevised 1970.

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